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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003905253 for a patent by VICIOUS POWER PTY LTD as filed on 26 September 2003.

WITNESS my hand this
Fifth day of October 2004

J. Billingsley

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SUPPORT AND SALES

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Patents Act 1990

ORIGINAL

PROVISIONAL SPECIFICATION FOR AN INVENTION ENTITLED

Invention Title: ARC LAMP IMPROVEMENTS

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The invention is described in the following statement:

This invention relates to head mounted arc lamps.

It is known to use low power metal halide arc lamps in portable lighting systems. These low powered arc light systems are popular in bicycling and other outdoor pursuits where it is necessary to have a portable, high-powered light source. It is also often required to have the light source head or helmet mounted. This requirement poses some problems with respect to the positioning of key components in the arc lighting apparatus.

Arc lamp technology cannot be simply powered from a low voltage battery. Arc lamps typically require a voltage pulse of around 6000 volts to strike the arc and then typically 50-100 volts to continue running. An electronic ballast is required to generate the starting voltage and deliver the running voltage. Because of high voltages involved, protection circuitry is also highly desirable to minimize the risk of arcing into the ambient environment in times when system integrity is compromised.

In known arc lamp systems, the control and ignition circuitry for low power arc lighting ballasts are always in a same physical location which may usually mean being physically combined on the same printed circuit board. In bicycle lighting applications, this limits the number of ways that arc lighting systems can be positioned.

It is known to use a simple ballast that sits in a carry bag attached to the frame of a bicycle. Battery power is delivered into the ballast on one side via a cable. The output of the ballast unit is delivered to the lamp via high-tension cable.

This has the disadvantage that a double insulated cable able to withstand a 6000 Volts ignition spike without breakdown must be provided. Cable capable of withstanding such voltage stress is normally thick and bulky, which is not ideal for helmet-mounted systems, where flexibility and ease of movement are desirable.

Further, many users would be uncomfortable with the thought of such a high voltage pulsing around the head and neck region. There is a further disadvantage that in the event of cable damage, arcing during the ignition phase of the lamp running cycle may prove hazardous. This is of particular concern in sports such as off road cycling where equipment damage is particularly likely.

An alternative known arrangement involves the entire ballast electronics being attached directly to the lamp with only low voltage cable running to the battery.

This addresses the issue of bulky and unsafe cables. However this arrangement does mean that the ballast electronics add significant size and weight to any helmet mounted system. This extra bulk can cause problems with helmet positioning and can put unwanted stress on neck muscles and joints. This issue is especially significant for riders who wish to use the equipment for extended periods such as 24hour or ultra-endurance events.

The invention in this case in one instance which may not be the broadest or only disclosure of the invention proposes that these two system functional parts are physically separated so that a part that will generate high voltage can be left to be close to the arc lamp itself while the part that will supply a running power at much lower voltage which will also generally be a heavier part will be able to be connected by a cable so that it can be located distal from a head of a user.

In one form then this could be said to reside in an arc lamp power supply in which there is a first part, and a second part where the first part includes means to draw and convert a low voltage supply to an arc running voltage supply , and includes a flexible electrical cable coupled to its output and connected to the second part to convey such running supply to said second part, and where said second part includes means to effect a high voltage supply for starting an arc in a connected

arc lamp and to maintain such high starting voltage only during a starting stage of the arc lamp.

The cable between the first and second parts then will then not carry high voltage.

In preference the first part which will by implication have the heavier components be adapted to be located on a belt for use around the waist of a user or on the frame of a bike or otherwise.

In preference the first part which may be referred to as a main power control module is located close to the battery. A trigger circuit and arc lamp which are the second part are located in a separate lightweight housing adapted to be helmet mounted. This can, where appropriate, be mounted elsewhere. It can be handlebar mounted at the option of a user. As a trigger circuit which is needed to supply a high voltage requires only a few small components, this allows the trigger/lamp assembly to be small and lightweight.

There is now therefore no cables of a type needed to carry high voltage to run over the head and neck of a user as the kilovolt trigger pulse is generated right at typically the lamp pins, safely inside the lamp housing.

A cable joining the first part and the second part only needs to be capable of carrying a 50-100Volt running voltage. Prior to ignition, there may be a brief period where cable voltage can reach a somewhat higher voltage of around 200-300 Volts. This is much less than the several thousand volts associated with known arc lamp systems. Cable of a rated capacity to withstand this few hundred volt electrical tension is light and flexible compared to the double insulated cables required to withstand kiloVolt stresses. Also, if this lighter cable is ever damaged, the risk of arcing into the ambient environment is low.

For a better understanding of this invention it will now be described with respect to the preferred embodiment which shall be described herein with the assistance of drawings wherein;

Figure 1 is a view of an arc lamp apparatus of the prior art, where the electrical components for striking the arc and maintaining it are located immediately adjacent to the lamp; and

Figure 2 is a view of an arc lamp apparatus according to the preferred embodiment of the present invention; and

Figure 3 is an electrical schematic of the arc lamp apparatus of Figure 2.

Figure 1 shows an arc lamp apparatus of the prior art. It consists of a lamp 1 physically attached and electrically connected to a ballast package 2. This ballast package is connected by low voltage cable 3 to a battery pack (not shown). All the electronics required to strike and maintain the arc in the arc lamp is included in the ballast package, including the relatively heavy ballast. Thus the ballast package is both substantially larger and heavier than the lamp itself. This weight is a considerable disadvantage when the lamp assembly is to be head-mounted.

Figure 2 shows an embodiment of an arc lamp apparatus made in accordance with the present invention. It includes a lamp 10, which may be the same as the lamp of Figure 1. It is attached to a trigger printed circuit board 11, containing only those electronic components required to generate the very high voltage spike required to strike the arc of the arc lamp. It is connected, via a cable 12 rated at 300V capacity, to a remote ballast pack containing the remaining electronics required to maintain the arc in the arc lamp, including the heavy ballast, and the battery power supply.

Figure 3 shows an electrical schematic of an embodiment of an arc lamp apparatus made in accordance with the present invention. It includes three basic elements, a DC battery power source 20, a power stage 21 and a trigger stage 22.

The power stage includes a ballast 23 which acts as a flyback DC-DC converter without output voltage regulation. The input to the DC-DC converter is controlled by microcontroller including an oscillator function 24 which controls switch 25. The output of the ballast is rectified by diode 26 and capacitor 27.

The power stage is capable of producing an output of about 50-100V during normal operation of the lamp and a somewhat higher voltage of about 230V during the arc strike phase.

Accordingly, the power stage is able to be connected to the trigger stage by electrical connections 28 rated at about 300V capacity. Such cables are much lighter and more flexible than high-tension cables.

The arc lamp 29 is connected to the output of the power stage 21 and via a trigger circuit made up of trigger capacitor 30, gas discharge tube 31 and trigger transformer 32.

In use, before the arc of the arc lamp is struck, the load on the power stage is essentially open circuit. The output voltage rises, charging trigger capacitor 30. At a certain voltage, in this case 230V, the gas discharge tube 31 fires, conducting a pulse of electricity through the primary winding of trigger transformer 32. When the gas discharge tube stops conducting, the output voltage of the trigger transformer 32 rises to several kV and the arc lamp 29 strikes. Subsequently the loaded output of the power stage is restricted to 50-100V and the lamp continues to burn.

It can be seen that the maximum voltage to which the remote ballast pack and the connecting cables can be exposed is the trigger voltage of the gas discharge tube,

in this case 230V. The much higher strike voltages are restricted to the trigger printed circuit board and the lamp itself.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognised that departures can be made within the scope of the invention, which is not to be limited to the details described herein but is to be accorded the full scope of the appended claims so as to embrace any and all equivalent devices and apparatus.

Throughout this specification the purpose has been to illustrate the invention and not to limit this.

Dated this 26th day of September 2003

VICIOUS POWER PTY LTD

By Their Patent Attorneys

COLLISON & CO

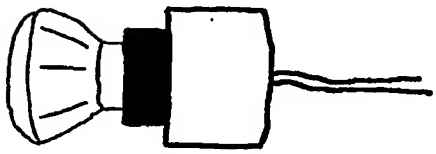

FIG 1

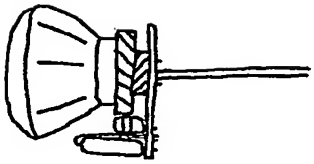

FIG 2

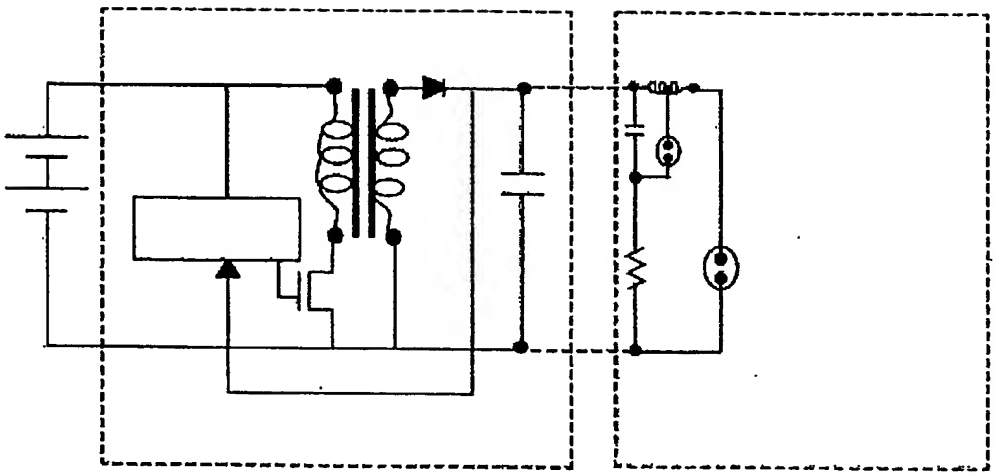

FIG 3

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